



CALIFORNIA FORESTRY NOTE

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Status of a Virulent Race of Blister Rust at Mountain Home Demonstration State Forest

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Mountain Home Demonstration State Forest (MHDSF) is located in Tulare County in the southern Sierra Nevada Mountains and is managed by the California Department of Forestry and Fire Protection (CDF). White pine blister rust (*Cronartium ribicola*) was discovered on MHDSF in 1968 from infections that started sometime in the mid 1960s. Blister rust is a disease introduced into the United States in the early 1900s and infects all species of white pines (five-needle pines). It undergoes multiple spore stages and infects plants in the genus *Ribes* to complete its life cycle.



White Pine Blister Rust on Sugar Pine

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Efforts to control the disease at MHDSF started immediately upon detection. Direct control efforts consisted of removing and pruning infected trees and pruning non-infected trees in an attempt to prevent infections on lower branches. By the mid 1970s this control strategy became ineffective as the infections became more widespread and occurred higher up in the tree crowns than could be effectively pruned.

Testing for genetic resistance began in the early 1980s. Approximately 15% of the sugar pine (*Pinus lambertiana* Dougl.) population at MHDSF was found to contain a single gene resistance mechanism known as major gene resistance (MGR). More than 50 seed trees were confirmed for MGR during extensive testing in the 1980s. These trees provided for a large bank of resistant seed, and out plantings of resistant seedlings were made in the 1980s and 1990s. These plantings were made in test plantations for specific seed sources and also in operational plantings for reforestation.

By the 1990s, blister rust had heavily pressured natural stands of sugar pine leaving mostly MGR resistant trees or trees with other resistant mechanisms. In 1996, blister rust infections were observed on trees in a natural stand that had endured previous infection periods and were believed to be resistant to the disease. Observations in test plantations of known resistant trees nearby also showed new infections. Testing confirmed that a virulent race of blister rust was present that was able to infect trees with MGR.

This same race of blister rust had been discovered in 1978 near Happy Camp in Siskiyou County but had not spread to any other locations in the State. The large geographical distance from Happy Camp to MHDSF leads to the conclusion that the disease has mutated to form the new virulent race and is not a migration or spread from the Happy Camp population. The MHDSF and Happy Camp locations are similar in that each has high blister rust inoculums and also large numbers of planted or natural MGR trees. These factors appear to favor the establishment of a new virulent race of the rust.

The difference between the virulent race of blister rust and normal strains is the ability to infect MGR trees. Blister rust spores taken from *Ribes* leaves can be used to infect known MGR trees in the laboratory to determine if the virulent race is present. This testing procedure had been used at MHDSF since 1996 to determine the extent and spread of the virulent race. In 1996 the virulent race of blister rust appeared to be confined to an area of approximately one square mile in the southern area of MHDSF near the Forest headquarters. By 2000, test plantations of MGR trees one mile north of the original infection center were found to contain the virulent race. Testing in 2002 showed that the virulent race had spread to a location 2.5 miles north of the Forest headquarters. A conservative estimate of the aerial extent of the virulent race at MHDSF is approximately 1000 acres. Testing within the infection area since 1996 has also shown an increase in the percentage of the virulent race compared to the normal race of blister rust. The virulent race represents almost 100% of the rust population in the core of the original infection area. This effect is expected, as the

new race has virtually only MGR trees in these stands to infect and perpetuate itself.

Selections and planting of MGR trees was discontinued at MHDSF after the discovery of the virulent race. The extent and intensity of the virulent race will continue to be closely monitored. Although a major blow to the development of genetic resistance to the disease at MHDSF, efforts will continue in the future to select for other multi-genetic resistance mechanisms that appear to have promise in producing blister rust resistant planting stock.

It is important that foresters keep a sharp lookout for unusual forest insect or disease problems during the course of daily activities. The possibility exists that the virulent race of blister rust may occur in other areas of the State. If you see an increase in blister rust infections in plantations of MGR trees or in natural stands that have been historically pressured by blister rust, report these occurrences to the USDA Forest Service or CDF using the Forest Pest Detection Report.

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